Short course

Advanced Process Monitoring and Supervision for Modern Manufacturing

DEPARTMENT OF CHEMICAL ENGINEERING
COLLEGE OF ENGINEERING
LOUISIANA STATE UNIVERSITY

BACKGROUND

Due to the availability of new industrial control system architectures, there has been a vast broadening of the domain of what is technologically and economically feasible to achieve in the application of computers to control industrial manufacturing systems. Now, all aspects of data gathering, information processing, process control, on-line optimization, scheduling and production planning functions can potentially be included in the range of tasks to be carried out by the computer control system. This has made possible the realization of Integrated System Control (ISC) in which all factors influencing plant performance are taken into account. "Control systems today have an expanded role, replacing manual manufacturing activities with full automation. Modern process control is the functional integration of real-time information management with closed loop control."

COURSE OBJECTIVE

The main objective of this course is to equip the participants with a good understanding of advanced process operation and monitoring techniques. At the end of the course, the participants should:

- ✓ Understand where multivariate data analysis and supervision algorithms are warranted.
- ✓ Have sufficient understanding of industrial data handling technologies and tools.
- ✓ Be aware of the role of statistical process control and expert systems in the total quality management/process improvement process.
- ✓ Have an appreciation of modern multivariate data analysis for detection of process status (normal and faulty conditions).

COURSE FORMAT

The course comprises a series of short lectures and hands-on workshops. Ample time will be available for questions and discussion during sessions and breaks.

WHO SHOULD ATTEND

Engineers, supervisors and specialists who are considering improving their process and plant performance or are involved in the design of new plants and wish to enhance their understanding in the field of Advanced Process Monitoring and Supervision.

COURSE OUTLINE

- **Advanced Monitoring in the Process Industry:** Monitoring Procedures; Monitoring Methods
- **Data Pre-processing:** Data quality; Cleaning raw data; Missing data,; Outlier detection/elimination
- **Multivariate Statistics:** Univariate Statistical Monitoring; Multivariate Statistics (T^2 Statistic); Data Requirements
- **Pattern Classification:** Introduction; Discriminant analysis; Feature extraction
- **Projection Methods;** Introduction; Principal Component Analysis (PCA) Algorithms; Partial Least Squares (PLS); Fisher Discriminant Analysis; Comparison PCA, PLS & FDA; Fault Diagnosis; Fault Detection; Fault Identification; Applications
- **Analytical (Model-Based) Methods:** Introduction; Parameter Estimation Methods; Observer-Based Methods; Applications
- **Knowledge-Based Methods:** Introduction; Causal Analysis; Expert Systems; Pattern Recognition; Combination Techniques

INSTRUCTOR

Professor Jose Romagnoli is the Director of the Laboratory of Process Systems Engineering at the Louisiana State University which is a consortium including many control vendors companies with advanced pilot facilities under state-of-the-art industrial control systems. He has a vast experience in industrial applications of advanced operational and control strategies and is a worldwide recognized expert in the general area of Process Systems Engineering. He is and has been consultant of a number of International companies. Professor Romagnoli is the author of the books "Data Processing and Reconciliation for Chemical Process Operations" and "Introduction to Process Control". He has over 300 international publications in the area of Process Systems Engineering and over 50 industrial reports.